



Alpine calving: processes and importance of a spreading phenomenon. The case study of Miage lake, Mont Blanc massif.

G. Diolaiuti (1), M. Citterio (2), T. Carnielli (1), C. D'Agata (1) and C. Smiraglia (1)

(1) Ardito Desio Earth Sciences Department University of Milan, Glaciology Research Group,

(2) Ardito Desio Earth Sciences Department University of Milan, Ice Caves Research Group-Italy

In the contemporary phase of intense glacier shrinkage, calving is a spreading phenomenon not usual for natural and human Alpine environments. In this paper the present distribution of calving glaciers in the Italian Alps is given; a comparison with the WGI data base compiled from data sources collected at the end of the 80s of the XX century shows a dramatic numeric increase. The typical features and processes of Alpine calving are discussed with reference to the Miage Lake (Mont Blanc Massif, Italy), selected as natural laboratory for testing techniques and methods and as representative site where to carry out most of the field observations. Details on thermal undercutting, crevasses spreading, supraglacial meltwaters and debris cover are presented, as well as the role they play in the Alpine calving process. Extensive details are given on the Miage lake calving cliff, on the lake bottom and on the glacier dynamics in the cliff area. The available data on the natural emptying episodes of the Miage Lake are discussed. The first complete DEM of the lake bottom, obtained by GPS survey and sonar eco-sounding in the residual ponds during the last emptying episode in summer 2004, is presented. Estimates of the water discharge in relation to the lake volume and emptying time are given together with a discussion on the water flows in the lake from the glacier. The calving rate has been calculated for the last three summer seasons by using topographic surveys and surface velocity data; the volume of icebergs calved into the lake has also been evaluated together with evaluations of its importance for the lake water balance. This paper also analyses the risks connected with the dynamics of the calving cliff: cliff collapses, falls of supraglacial debris in the lake, anomalous waves risen by ice and debris entering the lake.